

REMARKS

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THE AMENDMENTS

In amended claims 15, 21 and 29 "R³, R⁴, are independently of one another, H or alkyl, cycloalkyl or aryl radicals" has been deleted. Furthermore, "unsubstituted" in claims 15, 21 and 29 has been deleted.

In amended claim 18 formulae Ia₁ and Ib₁ have been deleted. Furthermore "R', R''', R'''' are H or alkyl, cycloalkyl or aryl" has been replaced with "R'. R'''' are H or alkyl, cycloalkyl or aryl, and R'''' is alkyl, cycloalkyl or aryl" in claim 18.

THE PRIOR ART

All claims as originally submitted were rejected under 35 USC § 102 as follows:

I. Claims 15 to 18 and 21 to 31, under § 102(e) over Moody et al. (US, 6,545,108).

II. Claim 15, under § 102(b), over Ehlers (CA 110:68452, 1989) , Hearn et al (J. Chem. Eng. Data, 31, 255-256, 1986), Klotzer et al. (Eingegangen am., 1731-1738, 1965) or GB 1584202.

III. Claims 15 and 16, under § 102(b), over Satpathy et al. (Synth. React. Inorg. Met. Org. Chem., 19 (10), 1049-1058, 1989.

The three rejections are separately discussed as follows.

1. Novelty of amended claims over Moody et al.

Moody et al. disclose catalyst compositions useful for the polymerization or oligomerization of olefins. These catalyst compositions comprise N-pyrrolyl substituted 1,2-diimine compounds. The carbon atoms of the diimine functionality are each independently substituted by hydrogen, hydrocarbyl, substituted hydrocarbyl, heteroatom connected hydrocarbyl, heteroatom connected substituted hydrocarbyl, silyl, boryl or ferrocenyl; in addition these two substituents may be linked by a bridging group (see column 8, lines 59 to 63 and disclose molecules in Moody et al.). Compound a₁₄ in column 13 of Moody et al. bears a five-membered ring that is substituted by two unsubstituted fused aromatic six-membered rings as substituents of the diimine carbon atoms.

In contrast to Moody et al., in amended claim 15 a 1,2-diimine of formula (I) is claimed, in which R³ and R⁴ together with the two diimine carbon atoms from a carbocyclic or heterocyclic five- to eight-membered ring which may be saturated or unsaturated and unsubstituted, substituted or fused with further carbocyclic or heterocyclic five- or six-membered rings which may in turn be saturated or unsaturated and

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In amended claims 21, 22, 29 and 30 compounds of formula (VI) are claimed. In these compounds of formula (VI) compounds of formula (I) are used as ligands of metal atoms M. Because of the afore mentioned concerning substitutes R^3 and R^4 , the compounds claimed in claims 21, 22, 29 and 30 are not anticipated by Moody et al., too.

Furthermore, applicants' process for preparing compounds claimed in claims 21 and 29, claimed in claims 23 and 31, a process for preparing olefins in the presence of the mentioned metal complexes, claimed in claims 24 to 27 and polyolefins, derived from that process claimed in claim 28, have not been anticipated by Moody et al..

2. Non-obviousness of amended claims over Moody et al.

Moody et al. disclose 1,2-diimines bearing hydrogen or aliphatic substituents at the carbon atoms of the two imine functionalities. Furthermore a compound is disclosed by Moody et al. wherein a carbocyclic ring is formed by the two substituents of the 1,2-diimine functionality, and this five-membered carbocyclic ring is substituted by unsubstituted fused aromatic 6-membered rings.

The difference between Moody et al. and amended claim 15 of the present invention is that 1,2-diimines of formula (I) are claimed by claim 15 of the present invention, wherein R^3 and R^4 together with the two imine carbon atoms form a

carbocyclic or heterocyclic 5- to 8-membered ring which may be saturated or unsaturated and unsubstituted, substituted or fused with further carbocyclic or heterocyclic 5- or 6-membered which may in turn be saturated or unsaturated and which are substituted.

These different substituent patterns of the compounds according to amended claim 15, hydrogen, alkyl radicals or a five membered ring substituted by unsubstituted 6-membered rings disclosed by Moody et al. in contrast to 5- to 8-membered rings according to amended claim 15 of the present invention, result in completely different characteristics of the metal complexes made thereof because of sterical and electronical situation.

This object has been achieved by 1,2-diimines according to the present invention.

The 1,2-diimines that are claimed by amended claim 15 bear 5- to 8-membered rings as substituents of the two imine carbon atoms. These 5- to 8-membered rings prevent the carbon-carbon atom bonding between the two imine carbon atoms from rotating around itself. By being connected by a 5- to 8-membered cycle, the rotation around the bonding of the two imine carbon atoms is eliminated. By preventing the carbon carbon bond from rotating the 1,2-diimine becomes much more sterically

defined when used as a ligand in a catalyst for a polymerization reaction. The 5- to 8-membered rings keep the ligand in shape, so that characteristics of the ligands/catalysts can better be controlled and/or predicted compared to the mainly undefined conformation of the 1,2-diimines having hydrogen or alkyl radicals as substituents. Furthermore, if 1,2-diimines according to amended claim 15 are used as ligands of catalysts, these catalysts show an enhanced activity while used in polymerization reactions. The substituents that are disclosed by Moody et al. are not able to prevent the ligands from rotating around the bonding between the two imine carbon atoms. This results in a more flexible metal complex having reduced activity as catalyst in polymerization reactions.

Furthermore the substituents claimed by amended claim 15 result in a different electronic situation of the metal center of a catalyst bearing the claimed ligands because of different electron donating or withdrawing effects of cyclic substituents compared to hydrogen or alkyl radicals disclosed by Moody et al.. These different electronic effects also have an influence onto the characteristics of catalysts prepared with these ligands, which results in a decreased activity of these catalysts in polymerization reactions.

Moody et al. disclose a 1,2-diimine that bears a five membered ring as substituents of the two imine carbon atoms that is substituted with two fused

unsubstituted 6-membered rings (compound a_{14} in column 13 of Moody et al.). In contrast to this in amended claim 15 1,2-diimines are claimed that bear further substituents on fused cyclic substituents of the above mentioned 5- to 8-membered rings (see R''' and R'''' of formula Id_1). These additional substituents R''' and R'''' have further advantageous effects on the steric and/or electronic situation, and therefore on the activity, of catalysts prepared with these ligands according to the present invention.

The examples of applicants' specification show that it is advantageously possible to use compounds of formula (I) as ligands in metal complexes of formula (IV), which are catalytical active in the polymerization or oligomerization of olefins, e.g. in the polymerization of ethylene. The polymerization process according to the present invention opens up a route to polymers having novel structures and properties.

The teaching of Moody et al that 1,2-diimines having hydrogen or alkyl radicals or cyclic substituents bearing unsubstituted fused 6-membered rings can advantageously be used as ligands of catalysts for polymerization reactions does not point in the direction that 1,2-diimines bearing cyclic, optionally further substituted, 5- to 8-membered rings as substituents of the two imine carbon atoms and therefore showing a completely different steric and/or electronic situation in catalysts having these 1,2-diimines as ligands can advantageously be used as catalysts with an enhanced activity that open up a route to polyolefins having novel structures and

properties. The possibility that 1,2-diimines having a cyclic structure according to amended claims 15 of the present invention provide a more rigid backbone and therefore different steric and electronic effects onto a metal atom of a corresponding catalyst has not been suggested by Moody et al..

Because of the above mentioned 1,2-diimines according to amended claim 15, metal complexes bearing the 1,2-diimines according to amended claim 15, claimed in amended claim 21 and 29, processes for the preparation of these metal complexes according to claims 21 and 29, claimed in amended claims 23 and 31, a process for the preparation of the polyolefins using the metal catalysts according to amended claim 21, claimed in amended claim 24 and a polyolefin prepared by the process according to amended claim 24, claimed in amended claim 28 would have not been obvious from Moody et al..

3. Novelty and Non-obviousness of amended claims over Ehlers et al., Hearn et al., Klotzer et al., GB 1 584 202 and Satpathy et al.

These references which are cited in the Office Action disclose 1,2-diimines bearing hydrogen or methyl as substituents at the carbon atoms of the 1,2-diimine functionality (R^3 and R^4 of formula (I) according to the present invention). No carbocyclic or heterocyclic substituents as it is claimed by amended claim 15 are disclosed in these documents.

Therefore amended claim 15 has not been anticipated by the cited references, because 1,2-diimines of formula (I) are claimed in amended claim 15, wherein R^3 and R^4 together with the two imine carbon atoms from a carbocyclic or heterocyclic 5- to 8-membered ring which may be saturated or unsaturated and unsubstituted, substituted or fused with further carbocyclic or heterocyclic 5- or 6-membered rings which may in turn be saturated or unsaturated and which are substituted. Compounds according to amended claim 15 have not been disclosed by the cited references, because the references only disclose 1,2-diimines having substituents like hydrogen or methyl.

According to the above mentioned the disclosure by Ehlers et al., Hearn et al., Klotzer et al., GB 1 584 202 and Satpathy et al. that 1,2-diimines bearing hydrogen and/or methyl as substituents at the two imine carbon atoms does not point into the direction of substituents R^3 , R^4 forming a five- to eight-membered cycle, optionally bearing heteroatoms and/or other substituents as claimed in amended claims 15 and 16 of the present invention, which create a different steric and/or electronic situation when used as a ligand of a metal complex.

CONCLUSION

For the reasons set out above the references do not anticipate applicants' claims.

Moreover, the presumption of non-obviousness is not overcome by the references because, as discussed above, the references actually teach away from applicants' invention and therefore do not make out the necessary prima facie case for obviousness. See, inter alia, *In re Baird*, 16 F3d 380, 29 USPQ2d 1550, 1552 (Fed.Cir. 1994) : "Knapp appears to teach away from the selection of bisphenol A by focusing on more complex phenols" The facts in *Baird* parallels the instant facts. As discussed above, it is quite clear that the references applied teach away from applicants invention.

Most significantly, the references fail to provide the *necessary* "reason, suggestion or motivation" to modify the compounds of the applied references to the extent necessary to come up with applicants' compounds and processes. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).